

Semester I

Core – I: Non-Chordates I: Protista to Pseudocoelomates

Programme Outcome:

- Understand the general characteristics of non-chordate groups of organisms.
- Acquire knowledge regarding classification of the taxa with examples.
- Develop an understanding of important phenomena associated with each taxon.
- Acquire skills in identifying representative species of groups studied.
- Illustrate phylogenetic distribution of lower groups of Non-chordates.

Course Outcome:

- Utilize information to understand the differences of the groups studied.
- Develop skills in examining diversity of the taxa.

Core-II: Principles of Ecology

Programme Outcome:

- Understand the concept of an ecosystem, its attributes, factors and functioning.
- Learn about population attributes, growth patterns, strategies; regulation and interactions.
- To appraise learners regarding various community characteristics.
- Comprehend biological data; learn graphical representation of data, sampling techniques, grasp basic statistics.
- Acquire skills on plotting survivorship curves, quadrat method of determining population density, diversity indices, techniques of preservation and mounting of plankton, determination of ecological parameters.

Course Outcome:

- Utilize information to understand interrelations and working of an ecosystem.
- Demonstrate the ability to comprehend data, plot graphs, present data and apply basic statistics.

Core-III: Non-Chordates II: Coelomates

Programme Outcome:

- Understand elaboration of coelomic evolution and metamerism on Coelomates with their classification up to their class and excretion system in Annelidans.
- Recognize insect vision, respiration and metamorphosis in Arthropoda with reference to Termites and in evolutionary significance of Onychophora with general characteristics.
- Obtain an over view of the general features, respiration, Gastropodan evolution, mechanism of torsion, and significance of larval life stages.
- Acquire knowledge on general characters and classification of Echinoderms and their affinities with Chordates.

Course Outcome:

- Develops skills in elaborating the general features and evolutionary significance of the coelomate from Annelida to Echinoderms.
- Impactful visual understanding and enables the students to correlate the evolutionary significance of each organism on the phylogenetic tree.
- Study on various general features and characteristics of body symmetry and arrangement with various vision types, excretory systems and developmental stage give a strong fundamental understanding on the subject on Coelomates.

Core-IV: Cell Biology

Programme Outcome:

- Introducing prokaryotic and eukaryotic cells and their features, ultrastructure of plasma membrane and mechanism of transport of molecules across plasma membrane.
- To know the structure, function and properties of endomembrane & cytoskeletal network system and cell organelles.
- To understand the importance of mitochondria in aerobes, the role of mitochondrial electron transport chain, oxidative phosphorylation & mechanism of ATP synthesis.
- To study the structure and packaging of chromosome in nucleus, behaviour of chromosome during cell division, cell cycle and its regulation.

Course Outcome:

- Understanding the difference between prokaryotic and eukaryotic cells and the mechanism of transportation across their membrane system.
- Understanding the role of cytoskeleton in maintaining structural frame work, cell motility and cell organelles.
- Deciphering the role of mitochondria in cellular respiration and energy production.
- Obtaining knowledge on structure and function of nucleus, cell division and regulation of cell cycle.

Core- V: Diversity and Distribution of Chordates

Programme Outcome:

- The students learn about the salient features, diversity and distribution of all Chordates.
- To know the evolution of aquatic, amphibious and terrestrial vertebrates.
- To understand the importance of distribution of vertebrates in different realms.

Course Outcome:

- Understanding the origin, larval forms, distribution and adaptation of different vertebrates.
- Accumulating the knowledge and understanding on the classification, affinities and comparative anatomy of different vertebrates and their evolutionary significance.
- Learning the mechanism of flight and aquatic adaptations in birds and mammals.
- Obtaining knowledge pertaining to the distribution of animals particularly vertebrate in different realms.

Core-VI: Physiology: Controlling and Coordinating systems

Programme Outcome:

- Develop an understanding of tissues and tissue systems with clarity on types and functions of each.
- Acquire knowledge on the muscle and nervous system.
- Insight on the history of endocrinology, study endocrine glands, hormones, control and regulation.
- Acquire knowledge on the various facts of the reproductive system and their endocrine aspects.

Course Outcome:

- Acquire skills in differentiating tissues based on their structure and functions.
- Gain insights on the controlling and coordinating systems of the body.
- Essential clarity on endocrine gland structures, hormones, functions and their regulations.
- Scientific knowledge based on reproductive system and placental hormones.

Core – VII: Fundamentals of Biochemistry**Programme Outcome:**

- To gain understanding of fundamentals of biochemistry and biological macromolecules.
- To understand structure, classification, properties and significance of biomolecules.
- Knowledge of microbial diversity and classification.
- Acquire knowledge on nomenclature, classification and mechanism of enzyme action, regulation and its kinetics.

Course Outcome:

- To understand the structure and biological importance of protein, carbohydrates, lipids, nucleic acids and enzymes.
- Providing knowledge on types of amino acids and its polymeric form.
- Obtain knowledge pertaining to future scopes and modern trends in microbiology.
- Understanding the experimental approaches to explore the origin of microbes.
- Understanding the morphology, classification and significance of host-vector relationship.
- Obtaining knowledge on enzymes and isoenzymes, specificity, inhibition, derivation of Michaelis-Menten equation.

Core – VIII: Comparative Anatomy of Vertebrates**Programme Outcome:**

- Understand anatomical significance of organ system in vertebrates.
- Comprehend structure, function and various derivatives of Integumentary, Skeletal, digestive, respiratory, circulatory, urinogenital and nervous system.

Course Outcome:

- Learner gains detailed overview of the anatomical resemblance amongst vertebrates hierarchies.
- Acquires knowledge on cellular development of organ systems in the vertebrates and linear progression of cellular derivatives during organogenesis.

- Understand the process of linear and vertical cellular evolutionary processes.

Core – IX: Physiology: Life Sustaining Systems

Programme Outcome:

- Knowledge of critical physiological processes.
- Understand anatomical attributes of Digestive, Respiratory, Renal and Cardiovascular system.
- Learn and develop an understanding of vital life-sustaining physiological processes.

Course Outcome:

- Appraise the significance of anatomical structures and physiological events.
- Apply information to understand the functioning of organisms.
- Demonstrate the ability to appreciate the occurrence of physiological actions.
- Understand interrelationships of life processes.
- Acquire practical skills in identifying different organs, and perform laboratory work based on theoretical applications.

Core – X: Biochemistry of Metabolic Processes

Programme Outcome

- Understanding of catabolism, anabolism and regulatory mechanism of intermediary metabolism.
- To learn the processes of carbohydrate, lipid and protein metabolism.
- To obtain knowledge on redox regulation and electron transport system.

Course Outcome:

- Gain overall knowledge and understanding on metabolic pathways and shuttle systems.
- Gain knowledge on carbohydrate metabolism related processes.
- Understanding of β -oxidation and catabolism of amino acids.
- Understanding on mitochondrial respiratory chain and oxidative phosphorylation.

Core – XI: Molecular Biology

Programme Outcome:

- Detailed information on DNA structure, different forms, their properties and types of RNA.
- Understanding mechanism of DNA replication and repair in prokaryotes and eukaryotes.
- Gain knowledge on mechanism of transcription and translation in prokaryotic and eukaryotic cells.
- Acquire knowledge on post transcriptional modifications of RNA.

Course Outcome:

- Gain knowledge on details of Watson-Crick Model of DNA, RNA types.
- Understand the process of DNA replication, transcription, translation and their regulatory mechanisms.
- Gain knowledge on genetic code & regulatory machinery.
- Understand gene expression and role of RNA interference elements.

Core – XII: Principles of Genetics

Programme Outcome:

- Obtain knowledge on the basic principles of genetics.
- To provide knowledge on the mechanism of sex determination and extra-chromosomal inheritance.
- To learn the process of DNA recombination, transposons and transposable elements.

Course Outcome:

- Acquire knowledge on the fundamentals of Mendelian and non-Mendelian genetics, chromosomal mapping and interaction of genes.
- Providing the knowledge and understanding on linkage, crossing over, sex determination and role of extra-chromosomal inheritance.
- Obtaining knowledge on chromosomal aberration, cause and consequences of mutations.

Core – XIII: Developmental Biology

Programme Outcome:

- Understand the phases of development, changes, regulation and the concepts of ageing and teratogenesis.

- Gain knowledge on In- Vitro fertilization and amniocentesis.

Course Outcome:

- Understand the basic concepts of gametogenesis, fertilization and embryogenesis.
- Gain knowledge on interferences in developmental biology.

Core – XIV: Evolutionary Biology

Programme Outcome:

- Gain overview of the beginning of life and evolutionary theories.
- Understand various physical forces or stress pressures during evolution.
- Gain knowledge on correlate of epigenetic changes in the cellular footprints of animals and genetic lineages exerted through various physical forces.
- Comprehend the origin of evolution in Hominides with reference to Primates; validate evidence of human origin by molecular and phylogenetic sequence analysis.

Course Outcome:

- Obtain knowledge of life initiation and its evolution through the chronological landscape.
- Know the evolutionary relationship of organisms with response to various physical forces leading to adaptive evolution.
- Strengthen student's analytical approach to evolutionary relationships.

PROGRAMME OUTCOME/COURSE OUTCOME: ZOOLOGY

M.SC., Estd.: 2023

SEMESTER: I

PAPER-101: BIOSYSTEMATICS, BIOINFORMATICS, NON-CHORDATES

PROGRAMME OUTCOME/LEARNING OUTCOME

- To understand the biological diversity and its origin. (Identification, description, naming, classification)
- Bioinformatics helps in analyze, develop, create large amount of data, develop specific drugs and accelerate biological data.
- Obtain an overview of the general features, respiration, metamorphosis, evolutionary significance of different phylum.
- To understand the importance of distribution of invertebrates in different realms.

PAPER-102: CELL BIOLOGY AND GENETICS

COURSE OUTCOME/LEARNING OUTCOME

- To know the structure, function, features of cell (Prokaryotic and eukaryotic), plasma membrane, cytoskeleton, cell organelles (Mitochondria, Golgi bodies, ER)
- To understand ETC, ATP synthases, oxidative phosphorylation.
- To study packaging of chromosome in nucleus, cell cycle and its regulation.
- To understand Mendelian, non-mendelian Genetics, genes, mutation, linkage, crossing over.

PAPER-103: PHYSIOLOGY, HISTOLOGY, HISTOCHEMISTRY

COURSE OUTCOME/LEARNING OUTCOME

- Develop an understanding of tissues, types and function of tissues.
- Acquire knowledge on muscle and nervous system.
- Understand different types of receptors.
- Study the techniques in differentiating different types of tissues through microscope.
- Acquire knowledge on osmoregulation and thermoregulation.

PAPER-104: INSTRUMENTATION AND BIostatISTICS

COURSE OUTCOME/LEARNING OUTCOME

- To study different types of instruments used in biology to differentiate carbohydrate, protein, lipid, nucleic acids.
- Basically to study centrifugation, spectrophotometry, chromatography, electrophoresis.
- To study statistical differentiation between different data on biological groups.

SEMESTER: 2

PAPER-201: BIOPHYSICS AND BIOCHEMISTRY

PROGRAMME OUTCOME/LEARNING OUTCOME

- To understand the structure and biological importance of protein, carbohydrate, lipids, nucleic acids, enzymes.
- Obtain knowledge on enzymes and isoenzymes, inhibition, derivation of Michaelis-menten equation.
- To study the principles of bonding between different types of biomolecules in the body.
- To gain knowledge about their de-naturation and renaturation.

PAPER-202: MICROBIOLOGY AND IMMUNOLOGY

PROGRAMME OUTCOME/LEARNING OUTCOME

- To obtain knowledge pertaining to future scopes and modern trends of microbiology, origin of microbes.
- To learn mechanism of action of microbial toxins and pathogenicity.
- Deducing knowledge on role of microbes in agriculture and healthcare sector.
- Study about antigenicity and immunogenicity.
- Different types of vaccines, hypersensitivity.

PAPER-203: ENDOCRINOLOGY AND REPRODUCTIVE PHYSIOLOGY

- To study the history of endocrinology, study of endocrine glands, hormones, their control and regulation.
- Acquire knowledge on different facts of the reproductive system and their endocrine aspect.
- To study about different types of lifestyle disorders/diseases and their prevention.
- To acquire knowledge on reproductive health.

PAPER-204: EVOLUTIONARY BIOLOGY AND ANIMAL BEHAVIOUR

- To acquire knowledge on beginning of life and evolutionary theories.
- Understand various physical forces or stress pressure during evolution.
- To study epigenetic changes in the cellular footprints of animals and genetic lineage.

SEMESTER: 3

PAPER-301: CHORDATES, COMPARATIVE ANATOMY AND ECONOMIC ZOOLOGY

- Study salient features, diversity and distribution of all chordates (origin, larval form, distribution, and adaptation), their classification, affinities.
- To know different evolutionary comparisons of different systems (integumentary, locomotory, circulatory, excretory, reproductive).
- To study different organisms having economic importance (honey bee-apiculture, earthworm-vermicomposting, silk moth-sericulture, oyster-pearl culture)

PAPER-302: DEVELOPMENTAL BIOLOGY

- Understand the phase of development, changes, regulation and the concepts of ageing and teratogenesis.
- Gain knowledge on IVF and amniocentesis.
- Understand gametogenesis, fertilization and embryogenesis.
- Understand the concepts like early, late and post embryonic development.
- Also understand the concepts of direct development and indirect development.

PAPER-303: ENVIRONMENTAL BIOLOGY AND WILDLIFE CONSERVATION

- To study the concept of an ecosystem, its attributes, factors and functioning.
- To study about growth patterns, strategies, regulation and interactions.
- Acquire skills on plotting survivorship curves, quadrat method of determining population density, diversity, indices, techniques, mounting and preservation.
- To study the habitat of different wildlife animals and their conservation.

PAPER-304: ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY

- To gain knowledge on critical physiological process.
- Understand anatomical attributes of different systems.
- Understand vital life sustaining physiological processes.
- To study about different model organisms of developmental biology.

SEMESTER: 4

PAPER-401B: STRUCTURE AND FUNCTION OF VERTEBRATES

- To study about different vertebrates.
- To study their pattern of evolution, growth pattern, metamorphosis and life span.
- Study about different adaptations, acclimatization seen in different phylum.
- To study about their reproduction and their contribution to the evolution.

PAPER-402B: POPULATION GENETICS AND EVOLUTION

- To study about the cause of increase of population, different control methods.
- Study how genetic difference affect population.
- Study about genetic drift, mutation, gene flow.
- Study about adaptation, speciation.
- Also study about different laws regarding conservation.

PAPER-403B: ENVIRONMENTAL BIOLOGY AND TOXICOLOGY

- Study about different pollution and their impact on human health and ecosystem.
- Effect of toxins, chemicals that may cause damage to living organisms, and the health effects associated exposure to them.
- To study how toxic chemicals are metabolized by organisms, how they move through food webs and ecosystems and their effect on species (lethal/non-lethal).

PAPER-404B: PROJECT WORK